

A Smallest Space Analysis of Factors Affecting Use and Non-use of Contraception

by

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Introduction

The Smallest Space Analysis (SSA) was developed by Louis Guttman in the middle of 1960s. It is a nonmetric technique by which only the rank order of the size of correlation coefficients among interested variables is of concern. Scrutinizing method underlying SSA enables ones to understand the basic concept of multi-dimensional scaling (MDS). Since its conception, SSA (as well as MDS) has been applied to various fields of studies (Kruskal and Wish, 1978; Bloombaum, 1970; and Guttman, 1967). This paper intends to demonstrate the powerful of SSA in uncovering the "hidden structure" of factors affecting contraceptive use¹.

Objectives

The primary purpose of this study is to illustrate an example of applying SSA in population studies.

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The analysis aims to answer the following questions.

1. How indicators selected to measure the concepts of the motivation to control, the availability of contraceptive supplies and service, and the subjective costs of fertility control are empirically grouped.
2. How these groups or dimensions are relatively correlated with contraceptive behavior.

Conceptual Framework and Literature Review

Studies in much of the developing world have documented the important role of increased contraceptive use in leading to lower fertility. What remains unclear is what causes women to voluntarily control their fertility.

This work draws on Easterlin's (1978) conceptual framework concerning contraceptive behavior. The key determinants of use of deliberate control typically include three types of variables—motivation, attitudes, and access (Easterlin, 1978). Motivation for contraceptive use stems from concerns about having or expecting to have more children than the desired number of children or having them too soon. Motivation to control is a measure of the demand for family planning. Attitudes toward fertility regulation refer both to the acceptability of the notion of family planning in general and to the safety of and feelings about specific contraceptive methods. It also includes pressure from significant others bearing on individuals' decisions regarding the use of contraception. Access relates to the availability of family planning services, supplies, and information. In general, the use of contraception is

hypothesized to have a positive relationship with motivation, favorableness of attitudes, and access. Theoretical and empirical studies related to these three key variables are described below.

Let start the discussion with the motivation to control. Szykman (1982) pointed out that a woman's reproductive life span can be found in one of the following three situations:

$$(1) C_{at} - C_d < 0;$$

$$(2) C_{at} - C_d = 0; \text{ and}$$

$$(3) C_{at} - C_d > 0;$$

where C_{at} is the actual number of children at time t and C_d is the desired number of surviving children at the end of the reproductive life. Theoretically, a negative value of $(C_{at} - C_d)$ indicates no motivation to control fertility. In practice, however, a couple may be using contraceptives for birth spacing. The motivation for fertility regulation should be originated when a couple has achieved its family size goal (situation 2). A positive value of $(C_{at} - C_d)$ indicates an excess fertility situation. The larger this excess fertility, the greater is the motivation for contraceptive use. It implies that this measure demonstrates the intensity or the strength of the motivation.

Another common measure of the motivation to control, which obtains directly from the question asked whether more children are wanted, also reveals the direction of the motivation. That is, it captures whether number of children living has reached or exceeded desired family size. But, the measure does not tell us about the intensity of the motivation to control. Conceptually, the desire for more/no more children appears to be less powerful in explaining variations in contraceptive use than the measure of $(C_{at} - C_d)$.

- Cd). In fact, empirical studies showed the contrary. Palmore and Concepcion (1981), Hermalin et al. (1979), and Freedman et al. (1975) found that the desire for more/no more children was related to contraceptive use slightly stronger than the (Cat - Cd) measure. In any case, the empirical evidence showed high consistency between the two measures, ranging from 73 to about 90 percent (Hermalin et al., 1979; Palmore and Concepcion, 1981).

A large number of recent fertility and family planning research studies have reported that the measure of reproductive intention is a significant predictor of contraceptive behavior (Fishbein, 1972; Freedman et al., 1975; Kar and Talbot, 1980; Nair and Chow, 1980; and Palmore and Concepcion, 1981). This finding is partly a result of the conceptual development of the demand for fertility limitation. The wide spread of family planning programs during the past decade have also made people conscious about their reproductive behavior and aware of their ability to control fertility.

The immediate determinant of reproductive motivation, or more specifically the desired family size, is the perceived costs and benefits of children. That the expectation of the values of children affects family size preferences is clearly evident in both theoretical and empirical studies (Arnold et al., 1975; Arnold and Pejaranonda, 1977; Davidson and Jaccard, 1975; and Mueller, 1972). Among a specified set of perceived costs and benefits of children, it was found that, in Korea, perceptions of financial costs and the companionship for parents and love predominate in influencing fertility preferences and behavioral intentions (Bulatao and Arnold, 1977). Generally, varying aspects of values of children affect fertility-related decisions and

behavior in different social settings. However, the associations between values and disvalues and fertility were summarized by Fawcett (1982) that perceived economic benefits from children are associated with high fertility, that psychological satisfactions seem to be related to low fertility, and that the impact of financial costs on fertility is not clear.

Of equal interest to the desired number of children is the preference for particular sex compositions. In her review of the sex preference literature, Williamson (1978) documented that Korea is one of the countries that has a strong son preference. The long history of son preference in Korea lies on not only economic reasons but also the emotional security, family structure, and religious reasons.

As for the family planning and fertility implications of son preference, it has been found that the results are less clear. One reason is the methodological problem. Arnold (1985) pointed out that some previous studies used multivariate techniques to analyze the impact of sex preference on fertility and fertility-related behaviors. The linearity assumption of this technique is violated due to the fact that the influence of sex preference on fertility varies with parities. Other measures of the effect of sex preference, which are often based on the actual family size, for example, the parity progression ratio, also have some weaknesses. Therefore, Arnold argued that a new precise index that quantifies the effect of sex preference on fertility is needed. Based on his new measure, he concluded that "... son preference will have some dampening effect on the fertility decline in Korea, but it will not be a major obstacle to the achievement of Korea's fertility goals." (Arnold, 1985: 287)

It is conceivable that motivation for contraceptive use is not the sole determinant of behavior. Attitude toward family planning, which is often referred to as the subjective cost of fertility regulation, is also assumed to have a significant impact on the decision to use contraception. The subjective cost associated with contraceptive use includes psychic as well as normative costs. It is very well described by Bogue (1983:152) as followed:

The attitudes and beliefs that imply a negative evaluation of contraceptive use, or the cultural, social, and psychological forces that influence individuals and couples not to begin contraceptive practice or to abandon it after a brief trial.

Moreover, Bogue (1983) who conducted one of the very few systematic studies of the subjective costs of fertility regulation provided us with a list of 16 different normative and psychic costs. Of course, the influence of these costs on contraceptive decisions varies from setting to setting. It is, however, often found that social disapproval of contraceptive use from significant others, fear of engaging in behavior that is unfamiliar, and difficulties of communication between spouses stood out to be the most important aspects of subjective psychosocial costs and received wide attention from researchers (see Bogue, 1983, for literature review). Again, it should be noted that if all three costs exist simultaneously in a social setting, their impacts on contraceptive use are not necessarily equal.

A woman may forego the use of contraceptives even if she has the intention to use them because of a lack of efficient means for action. Therefore, availability (actual and perceived) of contraceptive services and supplies can be seen as having an independent effect on the adoption of fertility control. There have been a considerable number of studies indicating the importance of contraceptive availability (Brackett, 1981; Rodriguez, 1978).

Most studies of contraceptive availability have focused on the effect of perceived availability. Women's perceptions of contraceptive availability do not necessarily correspond to actual availability (Lewis and Novak, 1982). It was noted that the impact of geographic availability on contraceptive behavior is weaker than of perceived availability (Tsui, 1982). Responses regarding knowledge of family planning outlets, which are available from most recent surveys, are often utilized as a measure of the respondent's perception of existing contraceptive supplies and services.

The argument has been made that sources of contraceptive supply will not only fulfill the unmet need but also be a change agent by acting through the processes of diffusion (Retherford and Palmore, 1982). That is family planning programs, in addition to reducing levels of unmet need by providing services and supplies of contraception, will promote the (additional) use of contraceptives by strengthening or creating the motivation for fertility regulation and legitimizing the use. Unfortunately, there is no empirical ground to support this contention. The data needed to examine this argument are not simply available.

Data and Methodology

Source of data

The data used in this study are taken from the Korean Population Policy and Program Evaluation Study (KPPES). The study is described in detail in a two-volume final report done by Palmore, Park, and Cho (1985). Therefore, only a brief summary of KPPES is presented here.

The main objective of the KPPES is to study the effect of the availability of contraceptives on birth control practice and subsequently the

decline of fertility. The project took place over the period 1975-1980. It consists of several surveys. At the exploratory phase, there were pre- and post- surveys of the Euiryoung Experiment (see also Park, Cho, and Palmore, 1977, for details). Then, a larger study was carried out in Cheju in order to experiment with the new delivery system. Hapchun was chosen as a comparison area. Baseline and post- surveys were conducted in both areas, in 1975 and 1980, respectively. The Intensive Survey, on which this study is based, was carried out as part of the post-survey.

The Intensive Survey was conducted in 1980 in both Cheju and Hapchun areas. Unfortunately, this survey is available only for the post-survey. In conjunction with the 1980 Census, the "short form" post-survey was taken of a 20% sample in both areas. A subsample of about 1,000 married women was further selected randomly in each area and subjected to an in-depth interview in the intensive survey. The questionnaire of the intensive survey consisted of 223 questions. Thus, it provides a very rich source of information on fertility and family planning attitudes and behaviors.

Selection of Sample

Pooled data from Cheju and Hapchun samples are analyzed in this study. The 1980 post-survey data indicated that Cheju's demographic experience, in general, was not much different from Hapchun's. Contraceptive use in Cheju was documented to approach that in Hapchun and fertility started to decline rapidly in the former in 1980. There is, thus, no reason to analyze data by space or area.

The present study is based on a (further) selected subsample. The main purpose of the selection is to avoid certain biological and behavioral

characteristics from biasing the results. Followings are criteria for the selection of our subsample.

1. The first criterion is due to the fact that infecund women are neither motivated to regulate their fertility nor in need of birth control. Therefore, the present analysis is limited to only a group of exposed women 15-45 years of age. "Exposed" women are defined as those who were currently married and whose husband were present, who were not pregnant at the time of the interview, who were not breast-feeding, and who perceived themselves as being able to become pregnant whenever then wanted to (except those who are themselves or their husbands sterilized).

2. Women who were currently using non-supply methods are, then, excluded from the analysis. Non-supply methods include abstinence, withdrawal, rhythm, abortion, and the category coded as "other methods". In fact, this group of respondents warrants a separate analysis but the number of cases is too small; so they are altogether dropped from the study. Note that sterilization and IUD, which do not need to be re-supplied, are included for analysis on the ground that they are program methods.

The final sample size subjected to the present analysis is 912 currently married women. The percent currently using contraceptive of this group of women is 53.4.

The Variables

Based on the literature review, four sets of variables are included for analysis.

- (1) Contraceptive use. This variable is arranged such that "use" and "non-use" of contraception have a perfect negative correlation (-1.00). "Use"

is defined as the current use of any of the following methods: IUD, pill, condom, injection, sterilization, and other female scientific methods such as diaphragm, tampon, sponge, foam, jelly, or cream. The remaining category, not currently using a method, is labelled as "non-use".

(2) Availability. Two measures of perceived availability of family planning are included. They are the knowledge of a source of family planning services and whether the respondents perceive that family planning workers and/or canvassers are helpful.

(3) Demand or Motivation. In order to effectively measure the notion of the demand for family planning, the measures of both son preference and value of children are included. The desire for no more children was used as an indicator of being motivated to limit family size.

(4) Costs of fertility regulation. Such variables as the perception of the approval of significant others, family planning discussion between husband and wife, and women's own attitude toward the use of contraception are included.

There are two subsets of variables in each of the last three sets of variables presented above. One subset is positively related to the "use" of contraception and the other is positively related to the "non-use" of contraception. The justification of this strategy will be given in the next section. A list of variables included for the analysis is presented in Appendix I for reference.

Method of Analysis

The main reason for choosing SSA is that it provides a spatial map which represents proximities of points in relation to each other as well as to all the other points. Through this approach, we can examine, at the same time,

both how variables are clustered and how these clusters or dimensions are relatively related to a particular variable, while other sophisticated techniques (for examples: factor analysis or multiple regression analysis) can do one but not the other. Although SSA does not produce any summary measures or numbers (except the index of goodness of fit), it is considered appropriate for the purpose of this study which is devoted primarily to examine the structure of the interrelationships among variables, included for analysis. The observed pattern would provide us a basis for understanding the process of family planning decision.

The input data for the analysis can be any measure of proximity such as frequencies, probabilities, correlations etc. In the present study, the input data for SSA is a matrix of gamma coefficients. For the output, each variable appears as a point in a coordinate space and the distances (d_{xy}) between the points correspond to the correlation coefficients (r_{xy}) in such a manner that the closer the two points are together, the higher the positive correlation between them. In other words, d_{xy} and r_{xy} are inversely related.

Therefore, one need not make any kind of assumptions of the relationship between d_{xy} and r_{xy} , except the assumption of monotonicity. This technique is particularly suitable for analyzing qualitative data. In addition, SSA provides the spatial solution of the lowest dimensional space in which the position of points still agrees (as nearly as possible) with the rank order of the input correlation coefficients. There are several computer programs developed to help perform the analysis (See details in Kruskal and Wish, 1981: 78-82). The program used for the present study was ALSCAL

(Alternating Least Squares Scaling), described in detail by Takane, Young, and Dee Leeuw (1976)).

For the present analysis, "use" as well as "non-use" of contraception are the interest. Therefore, they will be considered to different variables, resulting in two points in the space diagram. Since one of our objectives to examine the relative proximities of the three attitudinal domains -motivation, subjective costs of fertility regulation, and perceived availability of contraceptive supplier-in relation to the "use" and "non-use" behavior, distances between points representing variables in these three groups of variables and points representing contraceptive practice are compared. That means that the relations between each indicator in the motivation, subjective cost, and availability domains and the "use" of contraception should be in the same direction (so that d_{xy} where Y represents the "use" of contraception could be compared). The same consideration also applied to the "non-use" case. Consequently, we will have one set of variables (composed of three subsets of variables which later will be called "motivation", "no-cost of birth control", and "availability" domains) which are positively related to the "non-use" of contraception. It means that we are expecting that the direction of the relationships between contraceptive behavior and measures in the three attitudinal domains are as hypothesized.

Findings

As expected, the Korean data yield positive relationships between the "use" of contraception and indicators of the "motivation", "no-cost", and "availability" domains and between "non-use" of contraception and indicators of the "no-motivation", "cost", and "non-availability" domains.

The two dimensional space was chosen for the interpretation. There are two reasons for the selection. Firstly and most importantly, it is easier to comprehend with the two dimensional space. Secondly, as suggested by Kruskal and Wish (1981: 58), for the purpose of clustering results, a two dimensional solution is far more useful than three or more dimensions. Three of the two dimensional space diagrams will be presented. The goodness of fit of the space diagrams in this study is expressed by a value called stress. Zero stress indicates a perfect fit of data to the configuration whereas a higher value corresponds to a lesser degree of goodness of fit²

Table 1 shows a correlation (gamma coefficients) matrix of variables that are positively related to the "use"³ of contraception. This matrix was submitted to the ALSCAL computer program in order to see how these twelve variables are empirically clustered.

The computer calculated and printed coordinates for every point in the space. The coordinates for the two dimensional space are shown in Table A (Appendix II) and the plot is presented in Figure 1. Three clusters are found to underlie nine variables; and the other three variables fall at some distance away from where other similar items are clustered. The result indicates fairly high intercorrelations among variables within the same cluster and relatively low intercorrelations between the "inliers" and those "outliers".

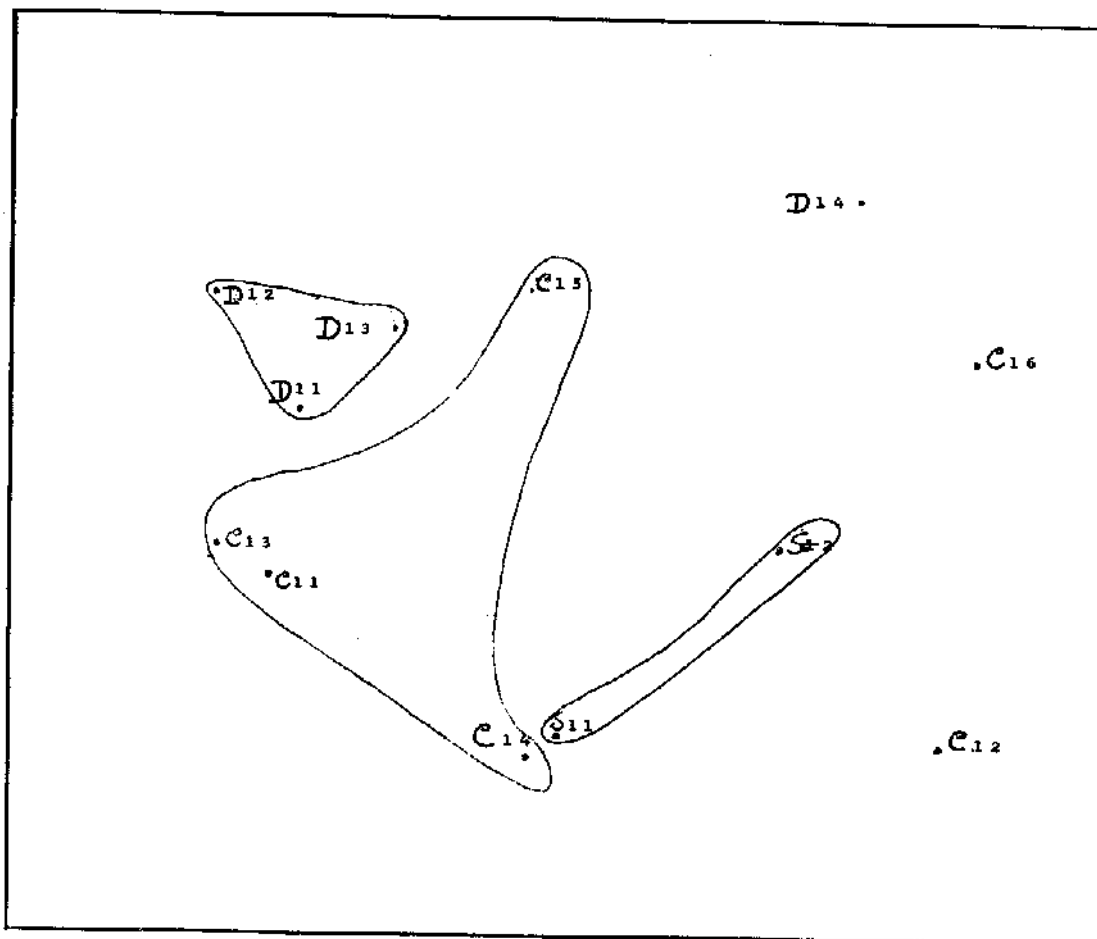
A closer examination of the diagram shows that variables that are widely used to measure the concept of the motivation to control (which are desire related to number and sex composition of family) cluster rather well. Of the two indicators of value of children, which are explanatory of desired family size and, subsequently, the motivation to control, concern about economic cost of children falls in the same group as the motivation to control⁴

Similarly, another two conventional measures: knowledge of where to get contraceptive supplies and whether the family planning personnel is perceived to be helpful, also form a cluster, representing the perceived availability of family planning service and supplies.

It is apparent from the diagram that variables used in this study to tap the concept of subjective costs of fertility regulation are scattered. It is indicative of various different sources of pressure on individuals' decision to practice contraception. However, we can empirically divide this dimension of family planning decision into three sub-dimensions. They are women own attitude toward contraception (C16), the communication between husband and wife (C12), and the perceived social approval of use (in Figure 1, they are C11, C13, C14 and C15). In addition, points representing perceived husband (C11) and relatives (C13) approval of use are close together in the latter sub-dimension. This result seems to suggest that women's perceptions of their husbands and relatives, particularly in-laws, regarding fertility regulation are based on the same ground and it is likely to be different from sources where their perception of friends are formulated.

The wide dispersal of variables in the social approval cluster causes its configuration to be more vulnerable to change with the inclusion or exclusion of items in the analysis. In any event, the basic structure should remain

Figure 1 Space diagram for twelve variables - solution for correlation matrix in Table 1 (Stress value 0.171)



S ₁₁ Know where	C ₁₁ Husband approval
S ₁₂ Staff is helpful	C ₁₂ Husband-wife communication
D ₁₁ Do not want more children	C ₁₃ Relatives approval
D ₁₂ No-son preference	C ₁₄ Friends approval
D ₁₃ Economic cost	C ₁₅ Large family size norem
D ₁₄ Psychological cost	C ₁₆ Woman's positive attitude

unchanged. That is, in Figure 1, points C11, C13 and C15 are close to the motivation cluster and point C14 is close to the availability cluster (This "hidden" structure will be seen clearly in the next diagram). This evidence, however, tends to suggest that the approval of wives' adoption of contraception from husbands and relatives affects the motivation to control. Szykman (1982: 328) further pointed out that these two types of approval tend to operate cumulatively in affecting contraceptive attitude and behavior.

The diagram also shows that the perceived availability of existing services and supplies is not only related to the actual availability but also a function of the perception of how many of one's friends practicing contraception. It is assumed that the perception of contraceptive behavior of friends is derived from the discussion among friends and neighbors. Through this activity, most women learn about contraceptive methods and sources. The important role of friends in promoting the awareness and knowledge of fertility control has also been found in studies in other countries. For example, in Columbia, Ochoa (1982) noted that about half of contraceptive users mentioned friends as their main source of information.

Turning now to an examination of another important question of the study - what is the pattern of the interrelationships between these dimensions and contraceptive behavior? The answer is found in Tables 2 and Figure 2. The two-dimensional coordinates of Figure 2 are also shown in Table B (Appendix II).

Before we go any further, there is an important point that needs to be discussed. Suppose we have six different sets of variables: A, B, C, D, E and F, it would be perfectly meaningful to look at the intercorrelation among variables in any groups or combination of these groups of variables and

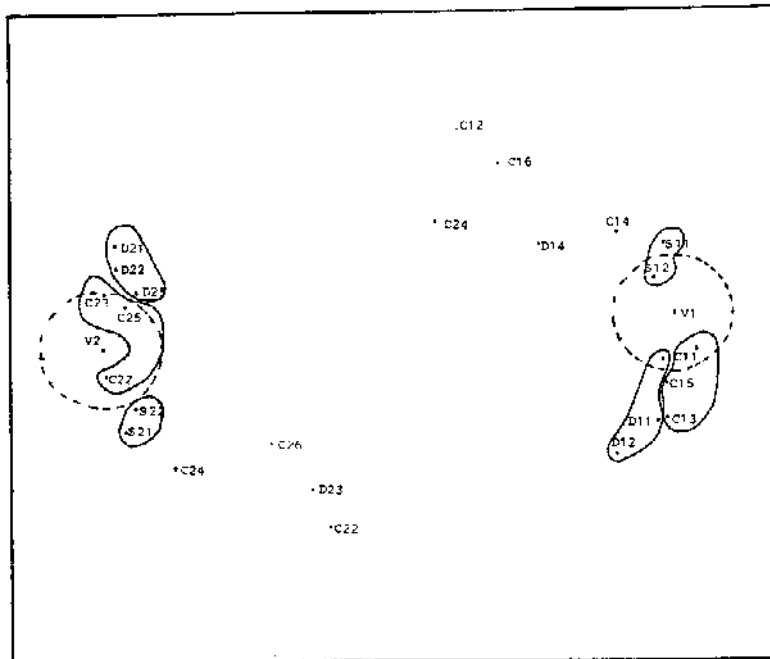
contraceptive behavior. Furthermore, if A, C and E are respectively parallel to B, D, and F (as illustrated below), results from the analysis that involves variables from the opposite groups, i.e. relating A and B to contraceptive behavior, can be compared⁵.

A Have-availability	B No-availability
C Have-motivation	D No-motivation
E Have-cost	F No-Cost

Unfortunately, most (pairs of) variables employed in this study are created from the same questions, only variables related to the value of children and women's attitude toward the use of contraception that can be derived from different, but parallel, sources. These variables, however, are considered to be important. More importantly, some of the variables related to the value of children correlate with others variables high enough to be able to differentiate the rank order of correlation coefficients, among variables in the "use" and "non-use" sets. As a consequence, the configurations of variables related to "use" and "non-use" of contraception, as respectively shown in Figure A and B (Appendix III), are not an image of one another. Therefore, it was decided to analyze both "use" and "non-use" sets of variables simultaneously in the same diagram, as shown in Figure 2. Besides, Figure 2 yields a substantially lower stress value which means a better fit to the data than Figure B.

Consider, now, the Figure 2 in detail. As expected, it shows that there are two sets of points, with one set in the right of the space diagram (will be called "use" region) surrounding the point representing "use" of contraception (U1) and the other in the left ("non-use" region) surrounding the point representing "non-use" of contraception (U2). Apparently, both points

Figure 2 Space diagram for twenty-seven variables-solution for correlation matrix in Table 2 (Stress value 0.198)



- | | |
|---|---|
| S ₂₁ Do not know where | C ₂₁ Husband disapproval |
| S ₂₂ Staffis not helpful | C ₂₂ No husband-wife communication |
| D ₂₁ Want more children | C ₂₃ Relative disapproval |
| D ₂₂ Son preference | C ₂₄ Friends disapproval |
| D ₂₃ Economic benefit | C ₂₅ No large family size norem |
| D ₂₄ Old age security | C ₂₆ Woman's negative attitude |
| D ₂₅ Psychological benefit | V ₂ Non-use |
| S ₁₁ Know where | C ₁₁ Husband approval |
| S ₁₂ Staff is helpful | C ₁₂ Husband-wife communication |
| D ₁₁ Do not want more children | C ₁₃ Relatives approval |
| D ₁₂ No-son preference | C ₁₄ Friends approval |
| D ₁₃ Economic cost | C ₁₅ Large family size norm |
| D ₁₄ Psychological cost | C ₁₆ Woman's positive attitude |
| | V ₁ Use |

representing "use" and "non-use" of contraception lie close to the center of its own region. It suggests that those surrounded variables are associated (positively) with "use" and "non-use" items, to a greater or lesser extent.

An attempt to assess the proximities of each dimension in relation to points U1 and U2 is made in Figure 2 by drawing circles of the same diameter around these two points (as shown in the broken line). It can be seen clearly that while the three variables within the left orbit are from the "social disapproval" cluster, three variables in the right orbit including S12, D13 and C11 are from the "availability", "motivation", and "no-cost" clusters, respectively.

A further interpretation can be made by thinking of the condition underlying "non-use" region ("no-motivation", "no-availability", and "cost") as characterize traditional societies. On the contrary, the condition of the "use" region ("motivation", "availability", and "no-cost") is more or less thought to typify many modern societies. Results from this diagram appear to suggest that, in the former type of society, social pressure related to fertility limitation prevent the majority of women from practicing contraception. On the other hand, in modern societies, where the regime of "controlled" fertility is prevail, motivation for, perceived availability of, and no-cost of birth control are all three important factors in determining use of contraception.

It is also interesting to note that results from the "use" region conform to Coale's three prerequisites for fertility decline (Coale, 1973). The closeness of the perceived economic cost of children to the point U1 implies that a woman makes a conscious choice about whether or not to have more children and the inclusion of S12 in the "use" orbit coincides with his third prerequisite

which stated "Procedures that will in fact prevent births must be known...[and available]..."(p.65)

Two further points may be noted in the diagram.

First, for both regions, the point representing husband (dis)approval of contraceptive use lies close to the point representing (non)use of contraception while the point representing husband-wife (no)communication about family planning tends to be some distance away from the contraceptive (non) item. It suggests that what women believe about their husbands' attitude toward the use of contraception is far more important than whether they ever discuss about this matter with the husbands. However, this may point to the incidence that such communication, if there is any, is not a real openly talk.

Second, as opposed to the high intercorrelations between the perception of significant others' attitude toward fertility control or social pressure items and contraceptive behavior, the correlation between women's own attitude toward birth control, either negative or positive, and the contraceptive behavior is very small. This result suggests that the social pressures exerted by significant others, especially from the husbands, is more important to women's decision to use or not to use contraceptives than their own personal preferences.

Of equal interest is the relative importance of motivation versus availability dimensions in relation to the use of contraception. The diagram in Figure 2 cannot be used to answer this question because items related to cost of fertility regulation seem to predominate, especially in the "non-use" region, in their relationships with the points representing contraceptive behavior. As a result, for example, points representing "no-motivation" and "no-availability"

are pushed away from point U2 by the "cost" items. How much of the distance being pushed depends partly on how closely of the relationship between each individual variable and the "cost" items. In order to get a clear picture of the relative distances of the motivation and availability items from the reference points -U1 and U2, the cost of regulation items are dropped from the next SSA run.

The space diagram in Figure 3 suggests that the use or non-use of contraception is tied closer to whether or not respondents are motivated to practice birth control than to whether or not respondents perceived the availability of contraceptive supplies and services.

Note that the item related to perceived psychological benefit of children (D25) lies close to the center of its region and to the non-use item (U2). At the same time, the economic cost of children item (D13) is also closed to the use item (U1). A check of correlation matrix indicates that the correlation coefficients between D25 and U2 and between D13 and U1 are not very strong (0.14 and 0.47, respectively). Then, why do they fall close to each other? The possible explanation is that D25 and D13 behave like the variables U2 and U1, respectively. That is, D13 (D25) is as highly correlated with the usual measures of availability (no-availability) and motivation (no-motivation) items --S11 (S21), S12 (S22), D11 (D21) and D12 (D22)-- as U1 (U2) correlates with these items. It tends to suggest that these two measures of value of children relate to use and non-use of contraception indirectly, through not only the demand but also the perceived supply factors.

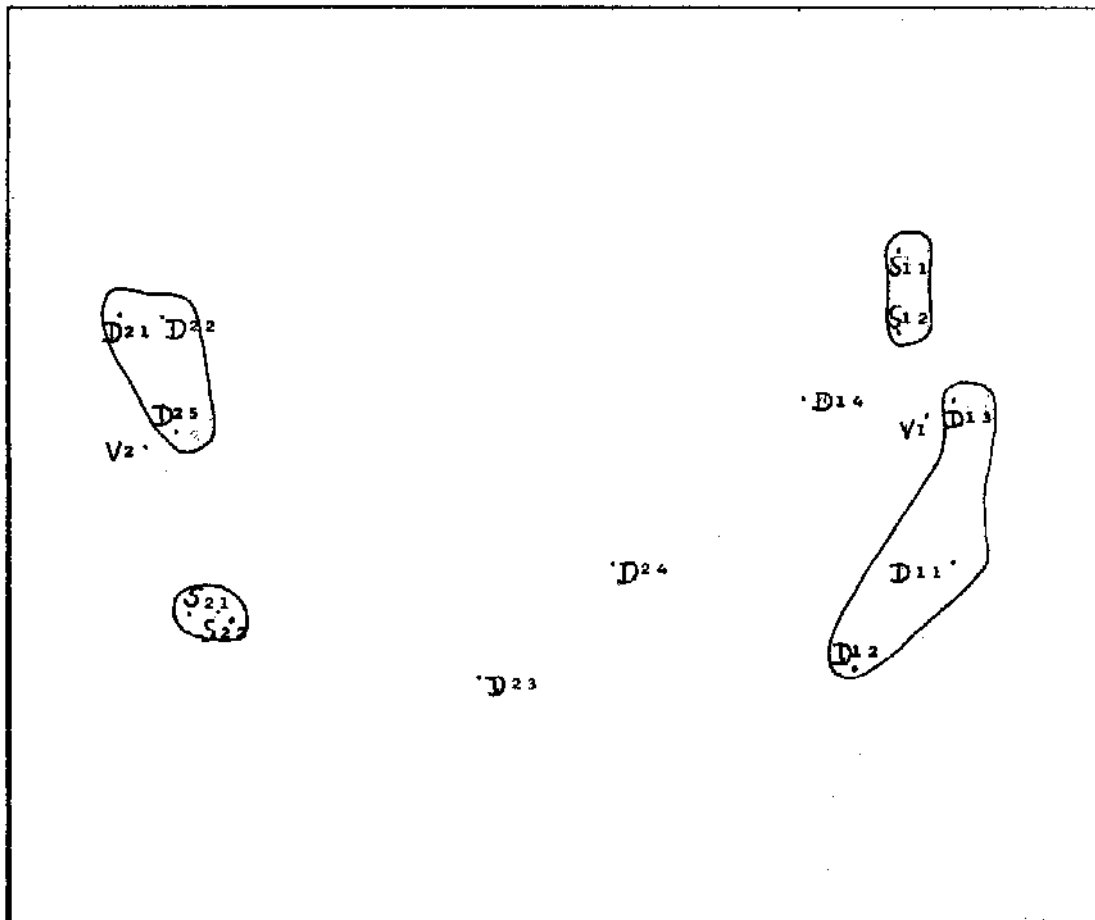
Concluding Remarks

Overall, the SSA produces a multidimensional structure of variables included for this study. We find that the conceptual scheme, developed by Easterlin, for grouping variables that influence contraceptive use is a useful one. It is "fair-to-good" supported by empirical evidence. The conventional variables selected to measure the motivation to control and the perceived availability of contraceptive supplies and service form two opposite clusters. Variables in each group are clustered rather well. On the other hand, variables representing subjective costs of fertility regulation are widely scattered.

However, it is important to note that husbands' approval of use is independently related to the wives' adoption of contraception more than any other variables, included for the study. In addition, it is found that social approval, one of the three sub-dimension of subjective costs, appears either to suppress or to enhance both the motivation to control fertility and the perceived availability of family planning service and supplies; and eventually the actual use of contraception. Similarly, as shown in Figure 3, variables related to value of children are also found to have some effect on the measures of both the demand and supply dimensions. These results tend to suggest that the key areas that we should look into in order to increase contraceptive prevalence are the value of children and sources of pressure imposing psychological costs on women, especially from husbands.

A further investigation has been made by examining the relative importance of the two dimensions --motivation for fertility control and perceived availability of contraceptive supplies-- in determining contraceptive

Figure 3 Space diagram for fifteen variables - solution for correlation matrix in Table 3 (Stress value 0.156)



S_{22} Do not know where

S_{22} Staff is not helpful

D_{21} Want more children

D_{22} Son preference

D_{23} Economic benefit

D_{24} Old age security

D_{25} Psychological benefit

V_2 Non-use

S_{11} Know where

S_{12} Staff is helpful

D_{11} Do not want more children

D_{12} No-son preference

D_{13} Economic cost

D_{14} Psychological cost

V_1 Use

use. The interrelationship pattern indicates that the motivation to control tends to correlate with the use of contraception more strongly than the availability factors.

In countries like Korea where availability of contraceptives is uniformly high, it is usually found that in a cross-sectional study,¹ indicators representing availability of contraception have relatively weak impact on the variation of birth control practice. However, it does not mean that this domain of variables is not important in determining the use of contraception. As demonstrated in the study using the same data set as the present one, various indicators of accessibility⁶ measured in 1980 are related significantly to retrospective measures of changes in fertility control, from 1976 to 1980 (Palmore, Park, and Cho, 1985: 353-94). This finding also in part helps to confirm our conclusion that perceived availability of existing services as well as the motivation to control fertility and the subjective costs affect the "use of contraception".

Footnotes

¹ In this paper, wherever positive and negative meanings of terms or concepts need to be differentiated (especially discussion of diagram in Figure 2), terms like "use" of contraception, "motivation", "cost", "availability", and "social approval" are used in oppose to "non-use", "no-motivation", "no-cost", "non-availability", and "social disapproval", respectively. These words are not written in the quotation mark, if they are used in their common usage (as the name of the category or as the general concept). However, they are sometimes written, for example: (non) use of contraception, to emphasize both positive and negative meanings.

² Sometimes, it is called a bandness of fit because higher values indicate the worse fit.

³ SSA was also run for variables that are positively related to "non-use" of contraception. However, it is not shown here because the basic configuration is similar to Figure 1. Results derived from diagram in Figure 1 can, therefore, be generalized to the "non-use" set of variables.

⁴ For "non-use" set of variables, psychological value of children (D25), instead of the economic cost of children, is included in the "no-motivation" cluster. However, variables in the "no-motivation" group are not as well cluster as those in the "motivation" group.

⁵ Since this study considers only variables that are positively related to the "use" and "non-use" of contraception, the combination of variables A, C and F are chosen to examine, as opposed to the combination of B, D and E.

⁶ The Palmore et al. study covers a wide range of measures of accessibility of family planning program, including economic, administrative, geographic, cognitive, and affective. Instead, the present study examines only cognitive and program quality measures.

Table 1 Correlation Matrix for twelve variables

	S11	S12	D11	D12	D13	D14	C11	C12	C13	C14	C15	C16
S11												
S12	47											
D11	30	28										
D12	-03	14	100									
D13	47	34	64	61								
D14	01	44	21	01	65							
C11	54	25	49	27	33	04						
C12	50	18	-02	14	-12	11	11					
C13	38	28	69	73	24	-07	86	-12				
C14	60	22	23	06	27	08	45	22	41			
C15	46	42	39	28	39	22	47	-20	27	14		
C16	04	23	-05	13	06	38	-17	28	-04	05	26	

Table 3 Correlation Matrix for fifteen variables

	S11	S12	D11	D12	D13	D14	U1	S21	S22	D21	D22	D23	D24	D25	U2
S11															
S12	47														
D11	30	28													
D12	-03	14	100												
D13	47	34	64	61											
D14	01	44	21	01	66										
U1	72	21	56	39	47	08									
S21	-100	-47	-30	03	-47	-01	-72								
S22	-47	-100	-28	-14	-34	-44	-21	47							
D21	-30	-28	-100	-100	-64	-21	-56	30	28						
D22	-24	-33	-75	-100	-45	-17	-41	24	33	75					
D23	-33	-01	15	08	-21	13	-02	33	01	-15	-05				
D24	-00	16	17	03	21	03	-09	00	-16	-17	-01	59			
D25	-44	-27	-57	-41	-38	-22	-14	44	27	57	36	25	09		
U2	-72	-21	-56	-39	-47	-08	-100	72	21	56	41	02	09	14	

Table 2 Correlation Matrix for twenty-seven variables

	S11	S12	D11	D12	D13	D14	C11	C12	C13	C14	C15	C16	U1	SZ1	SZ2	DZ1	DZ2	DZ3	DZ4	DZ5	CZ1	CZ2	CZ3	CZ4	CZ5	CZ6	U2	
S11	47																											
S12	30	28																										
D11	03	14	100																									
D12	47	34	64	61																								
D13	01	44	21	01	65																							
D14	54	25	49	27	33	04																						
C11	50	18	-02	14	-12	11	11																					
C12	38	23	89	73	24	47	86	-12																				
C13	60	22	23	06	27	08	45	22	41																			
C14	46	42	39	26	29	22	47	-20	27	14																		
C15	04	23	-05	13	06	38	-17	29	-04	05	26																	
V1	72	21	96	99	47	08	65	24	49	38	28	05																
SZ1	-100	-47	-30	03	-47	01	54	-50	-38	-60	-46	-04	-72															
SZ2	-47	-100	-28	-14	-34	-44	-25	-18	-28	-22	-42	-23	-21	47														
DZ1	-30	-28	-100	-100	-54	-21	-49	02	-68	-23	-39	05	-56	30	28													
DZ2	-24	-33	-76	-100	-45	-17	-47	-10	-55	-13	-21	-07	-41	24	33	75												
DZ3	-33	-61	15	08	-21	13	-21	-26	03	-04	-22	-68	-02	33	01	-15	-05											
DZ4	-00	16	17	03	21	03	-00	22	11	28	-10	03	-09	00	-16	-17	-01	59										
DZ5	-44	-27	-57	-41	-38	-22	-33	-02	-40	-24	-38	27	-14	44	27	57	36	25	09									
CZ1	-54	-25	-49	-27	-33	-04	-100	-11	-86	-45	-47	17	-65	54	25	49	47	21	00	33								
CZ2	-50	-18	02	-14	12	-11	-11	-100	12	-22	20	-38	-24	50	18	-02	10	24	-22	02	11							
CZ3	-38	-28	-89	-73	-24	07	-86	12	-100	-41	-27	04	-49	38	28	89	56	00	-11	40	86	-12						
CZ4	-60	-22	-23	-06	-27	-08	-45	-22	-41	-100	-14	-05	-38	60	22	23	13	04	-26	24	45	22	41					
CZ5	-46	-42	-39	-28	-39	-22	-47	20	-27	-14	-100	-26	-29	46	42	39	21	22	10	38	47	-20	27	14				
CZ6	38	-29	-02	16	-08	-03	-32	-16	-17	-06	-37	-35	-23	-38	29	02	13	23	15	06	32	16	17	08	37			
V2	-72	-21	-56	-39	-47	-08	-65	-24	-49	-38	-26	-05	-100	72	21	56	41	02	09	14	65	24	49	38	29	14		

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Appendix I

List of Variables

A. Contraceptive behavior

Method in current use by respondents

U1 = any modern contraceptive methods U2 = not currently use

B. Availability ("availability":S1_; "non-availability":S2_)

Do you know where to get contraceptive supplies?

S11 = Yes S21 = No

Was the canvasser or family planning workers helpful?

S12 = Yes S22 = No

C. Motivation ("motivation":D1_; "no-motivation":D2_)

Do you want to have more children?

D11 = No D21 = Yes

Son preference

D12 = Desired number of boys-desired number of girls ≤ 0

D22 = Desired number of boys-desired number of girls > 0

Reasons for not wanting another child

D13 = Because having another child would be a financial burden for family

D14 = Because you would not be able to give enough care and attention to all your children

Reasons for wanting another child

D23 = So that there will be one more person to help your family economically

D24 = To be sure that in your old age you will have someone to help you

D25 = To have someone for you to love and care for

D. Costs of fertility regulation ("cost":C1_ ; "no-cost":C2_)

Would your husband mind if you used a contraceptive?

C11 = No, do not mind C21 = Yes

Does your husband talk about matters of contraception with you?

C12 = Yes C22 = No

Whether or not there is some relatives against the use of contraceptives?

C13 = No, there is not C23 = Yes, there is

How many of your friends, relatives, and neighbors are using contraception?

C14 = Many C24 = None or very few

Do your friends or neighbors envy à family with many children?

C15 = No C25 = Yes

Contraceptive attitudes

C16 = The most important thing about contraception is that it makes sex worry-free and enjoyable

C26 = The whole idea of contraception is unpleasant to me

Appendix II

Table A Coordinates in the Two-space Diagram for Figure 1, Obtained from Correlation Matrix in Table 1

Variables	Coordinates	
	Horizontal	Vertical
S11	-0.02	-1.22
S12	0.90	-0.23
D11	-0.96	0.30
D12	-1.25	0.91
D13	-0.61	0.74
D14	1.09	1.40
C11	-1.07	-0.49
C12	1.45	-1.33
C13	-1.27	-0.35
C14	-0.10	-1.44
C15	-0.04	1.09
C16	1.87	0.61

Table B Coordinates in the Two-space Diagram for Figure 2, Obtained from Correlation Matrix in Table 2

Variables	Coordinates	
	Horizontal	Vertical
S11	1.39	0.70
S12	1.35	0.39
D11	1.41	-0.61
D12	1.14	-0.80
D13	1.42	-0.13
D14	0.74	0.67
C11	1.57	-0.10
C12	0.33	1.38
C13	1.42	-0.62
C14	1.15	0.72
C15	1.39	-0.29
U15	1.46	0.16

Table B (Continued)

Variables	Coordinates	
	Horizontal	Vertical
S21	-1.39	-0.66
S22	-1.36	-0.52
D21	-1.47	0.64
D22	-1.42	0.51
D23	-0.46	-1.07
D24	0.19	0.86
D25	-1.34	0.30
C21	-1.51	-0.22
C22	-0.34	-1.37
C23	-1.48	0.33
C24	-1.15	-0.91
C25	-1.40	0.24
C26	-0.66	-0.76
U2	-1.51	-0.11

Table C Coordinates in the Two-space Diagram for Figure 3, Obtained from Correlation Matrix in Table 3

Variables	Coordinates	
	Horizontal	Vertical
S11	1.24	1.11
S12	1.24	0.71
D11	1.43	-0.47
D12	1.02	-0.97
D13	1.44	0.34
D14	0.88	0.35
U1	1.36	0.26
S12	-1.25	-0.78
S22	-1.36	-0.71
D21	-1.58	0.72
D22	-1.46	0.75
D23	-0.29	-1.06
D24	0.21	-1.47
D25	-1.38	0.16
U2	-1.50	0.07

Appendix III

Figure A Space diagram for thirteen variables in the "use" set (Stress value 0.169)

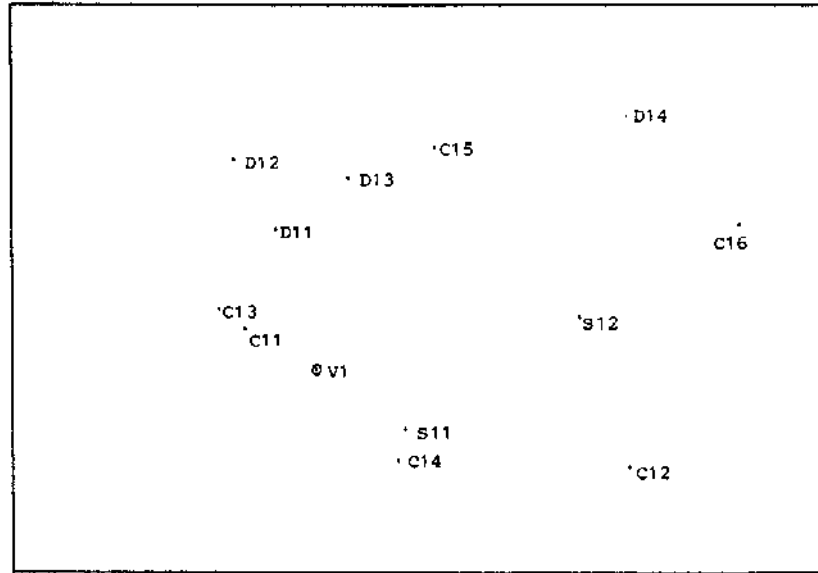


Figure B Space diagram for fourteen variables in the "non-use" set (Stress value 0.227)

